General

Guideline Title

ACR Appropriateness Criteria® blunt chest trauma.

Bibliographic Source(s)

Chung JH, Cox CW, Mohammed TH, Kirsch J, Brown K, Dyer DS, Ginsburg ME, Heitkamp DE, Kanne JP, Kazerooni EA, Ketai LH, Ravenel JG, Saleh AG, Shah RD, Steiner RM, Suh RD, Expert Panel on Thoracic Imaging. ACR Appropriateness CriteriaÂ® blunt chest trauma. [online publication]. Reston (VA): American College of Radiology (ACR); 2013. 9 p. [53 references]

Guideline Status

This is the current release of the guideline.

Recommendations

Major Recommendations

ACR Appropriateness Criteria®

Clinical Condition: Blunt Chest Trauma

Variant 1: First-line evaluation. High-energy mechanism.

Radiologic Procedure	Rating	Comments	RRL*
X-ray chest	9	Chest x-ray and CT/CTA are complementary examinations.	☢
CT chest with contrast	9	Ideally, this procedure should be performed with CTA. Chest x-ray and CT/CTA are complementary examinations.	☢☢☢
CTA chest with contrast	9	Chest x-ray and CT/CTA are complementary examinations.	☢☢☢
CT chest without contrast	5		☢☢☢
US chest	5		O
CT chest without and with contrast	2		☢☢☢
MRI chest without and with contrast	2		O
MRI chest without contrast	1		O

Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level
Radiologic Procedure	Rating	Comments	RRL*

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 2: Normal anteroposterior (AP) chest radiograph, normal examination, and normal mental status. No high-energy mechanism.

Radiologic Procedure	Rating	Comments	RRL*
CTA chest with contrast	5		☢☢☢
CT chest with contrast	5		☢☢☢
CT chest without contrast	4		☢☢☢
MRI chest without and with contrast	2		O
CT chest without and with contrast	1		☢☢☢
US chest	1		O
MRI chest without contrast	1		O
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			***Relative Radiation Level**

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 3: Clinically suspected cardiac injury after initial imaging and clinical evaluation.

Radiologic Procedure	Rating	Comments	RRL*
US echocardiography transthoracic resting	8		O
CTA coronary arteries with contrast	5	Use this procedure if looking for coronary artery injury.	☢☢☢☢
US echocardiography transesophageal	5	Use of this procedure depends on TTE findings.	O
MRI heart function and morphology without and with contrast	4	Use this procedure as a problem-solving tool. See statement regarding contrast in the text under "Anticipated Exceptions."	O
MRI heart function and morphology without contrast	4	Use this procedure as a problem-solving tool.	O
Thallium-201 SPECT heart	3		☢☢☢☢
Tc-99m sestamibi SPECT heart	3		☢☢☢☢
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			***Relative Radiation Level**

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Summary of Literature Review

Introduction/Background

Blunt trauma is very common in the United States and is a significant cause of mortality in younger adults; most cases are related to high-energy mechanisms, such as motor vehicle accidents, motor cycle collisions, and falls. According to the World Health Organization data, 1.21 million people world-wide died from car accidents. In the United States, it is estimated that trauma is responsible for approximately 100,000 deaths annually. Accidents (unintentional injuries) are the fifth most common cause of death after heart disease, cancer, chronic lower respiratory diseases,

and cerebrovascular accidents. In the United States, accidents (including motor vehicle accidents) continue to be the most common cause of death among people ages 15 to 44 accounting for approximately 40,000 deaths in 2010. Among people ages 15 to 24, motor vehicle accidents are by far the most common cause of death.

Approximately 25% of deaths from blunt trauma arise from chest injuries, although up to 50% of deaths are at least partially related to thoracic injuries. It is essential to diagnose and treat emergent thoracic injuries quickly, and imaging plays an essential role in diagnosing these injuries. The imaging manifestations of thoracic trauma are diverse and include musculoskeletal, pleural, pulmonary, and mediastinal findings. The most devastating injury to the thorax from blunt trauma is acute aortic injury or transection, and the most common thoracic injury is a rib fracture; see previous ACR Appropriateness Criteria® for these specific indications. This set of guidelines will discuss imaging in blunt thoracic trauma in the broadest sense.

Chest Radiography

The anteroposterior (AP) chest radiograph is a standard part of the trauma workup at most level I trauma centers across the United States. This is often combined with an AP pelvic radiograph and a lateral horizontal-beam cervical spine radiograph to quickly assess the patient for emergent injuries and to triage patients. A multitude of injuries can be detected or inferred from chest radiography; these include acute aortic injury, pulmonary injury, pneumothorax, hemothorax, extrapleural hematoma, large airway rupture, hemidiaphragmatic rupture, or musculoskeletal injury. The most devastating of these is acute aortic injury, and chest radiography continues to be an appropriate primary screening modality in its assessment, as noted in the National Guideline Clearinghouse (NGC) summary ACR Appropriateness Criteria® blunt chest trauma—suspected aortic injury. In addition, patients with blunt trauma are often intubated and have other lines and tubes inserted as well. The AP chest radiograph is essential to quickly exclude obvious misplacement of lines and tubes that may be difficult to detect in the setting of multitrauma.

Although they seem to be essential to the care of critically ill blunt trauma patients, AP chest radiographs in the trauma setting are often of low quality. If patients are in severe pain or are unconscious, full inspiration is usually not possible. Overlying material is the rule rather than the exception, and motion artifact is common. The mediastinum may appear falsely enlarged due to AP projection. Given these shortcomings, many studies have shown that AP chest radiographs miss many injuries that are evident on computed tomography (CT).

A single-center study evaluating occult pneumothoraces (identified on CT but not on AP chest radiography) in the setting of blunt trauma, showed that up to 55% of pneumothoraces detected on CT were occult on AP chest radiography. This was likely an underestimation, given that patients who had apparently normal AP chest radiographs were often not evaluated with chest CT, as is common in many trauma centers. The authors used the clinical radiology reports for the initial review of data but reassessed radiographs with occult pneumothoraces to ensure that the pneumothorax was not simply missed on the initial review. Another study found that occult pneumothoraces were actually visible on AP chest radiography in 12% to 24% of cases in a blinded retrospective review. The agreement between radiologists for detecting subtle pneumothoraces was fair (kappa scores: 0.55–0.56), which was not surprising given the low quality and low contrast resolution of AP chest radiography in the trauma setting.

Another study also showed the modest sensitivity of AP chest radiography for thoracic injuries. In this study of 374 patients with blunt trauma, approximately half of all pneumothoraces, rib fractures, and pulmonary contusions were not apparent on AP chest radiography. Nearly three-fourths of all hemothoraces were also not identified on AP chest radiography. The authors focused on the ability of combined chest radiography and abdominal CT to detect most pertinent chest injuries. Even with the combined AP radiograph and abdominal CT, one-fifth of all pneumothoraces, rib fractures, and pulmonary contusions were still missed. Moreover, all 5 cases of aortic injury were not evident on chest radiograph or CT abdomen, which argues against over-reliance on chest radiography in the setting of high-energy mechanism blunt trauma.

The authors of a prospective comparative study showed that chest CT revealed an acute injury (most often pulmonary contusion and pneumothoraces) in 39% of patients with no thoracic symptoms or signs, a negative chest radiograph, and recent high-energy mechanism blunt trauma (MECH group). This was in contrast to patients with clinical chest symptoms or abnormal chest radiographs (CTL group) in which 66% had injuries noted with chest CT but not radiography. Furthermore, additional data from chest CT scans led to alterations in management in 5% of the MECH group and 20% of the CTL group, leading the authors to conclude that chest radiography is inadequate in the setting of high-mechanism blunt trauma.

Using chest CT as a gold standard, a retrospective study evaluated the accuracy of portable chest radiographs in the setting of stable patients who had suffered recent blunt trauma. Stable patients were defined as those who were not intubated, normotensive, and nonhypoxic. In 95 patients with "normal" chest radiographs, CT showed that 38 had traumatic injuries. Furthermore, in 63 patients with "abnormal" radiographs, CT showed no evidence of acute injuries in 18 of those patients. In 32 patients, CT led to changes in patient management. Given chest radiography's relatively poor sensitivity and specificity for blunt injuries, the authors suggested that routine chest radiography may not be necessary in stable patients with blunt trauma.

In summary, AP chest radiography has lower accuracy for blunt traumatic injuries than CT. Reliance on radiography as the sole means to detect

traumatic thoracic injuries is, therefore, likely not prudent. However, the ability to acquire a radiograph in the trauma bay with little interruption in clinical survey, monitoring, and treatment (especially important in severely injured patients) as well as radiography's accepted role in screening for traumatic aortic injury and rapid evaluation of line and tube placement supports the routine use of chest radiography in the setting of blunt trauma.

Computed Tomography

As previously noted, chest CT is much more accurate than a chest radiograph in evaluating blunt thoracic trauma. It is such a trusted modality in detecting thoracic trauma that much of the literature treats contrast-enhanced chest CT as a gold standard. However, given the increased cost and radiation dose from chest CT, some have questioned the routine use of chest CT in all cases of blunt trauma. Unfortunately, there are conflicting data on whether routine chest CT is necessary in the setting of blunt trauma.

In a prospective study of 464 consecutive patients with severe blunt trauma, all were scanned with contrast-enhanced CT of the chest—routine multidetector CT (MDCT) algorithm. A selective MDCT algorithm subgroup of 164 patients was identified. This group was defined as patients in whom clinical or radiographic findings suggested a possible thoracic injury. Additional diagnoses (compared to radiography) were found more often in the selective group than in the routine group (59% compared with 43%, respectively). However, the routine MDCT algorithm resulted in 104 extra patients in whom radiographically occult findings were identified. In 34 of these 104 patients, there was a change in management, usually from additional pulmonary and mediastinal injures.

In a small retrospective study of 93 patients with blunt trauma who were evaluated with AP chest radiography and chest CT, the authors identified 25 patients with normal chest radiographs. In 13 of these 25 patients, CT scans showed multiple injuries, including 2 aortic lacerations. The authors concluded that the routine use of chest CT is prudent to detect rare but important thoracic injuries.

Other studies, however, have found that routine use of chest CT may not be necessary in the setting of blunt trauma. In a retrospective study of 542 patients with a history of motorized blunt trauma who underwent full body CT, the researchers identified 108 patients who experienced no tenderness, deformity, or bruising over the chest, abdomen, or pelvis and no hemodynamic compromise. CT identified acute thoracic injuries in 11 of those 108 patients, but none required direct and immediate intervention. Eight of the 11 patients were either intoxicated or had distracting injuries. Based on their findings, the authors suggested that CT use is likely of low yield in patients with normal examinations, with no distracting injuries, and with normal mental status.

Another group created a predictor of chest injury using chest CT based on a logistic regression analysis of 9 clinical and radiographic variables in 1,047 patients who suffered high-energy blunt trauma. They found that chest CT identified chest injuries in 13% of patients who would not have been predicted to have chest injuries, and only 2% had injuries that were considered clinically relevant. The authors concluded that a selective model of chest CT use in the setting of blunt trauma is acceptable, given the low rate of clinically significant injuries detected by using their model, in addition to the low morbidity and mortality that arises from most chest injuries (small pneumothoraces, pulmonary contusions, and rib fractures). A similar study supported use of a predictive model based on radiographic, clinical, and demographic data to select patients in whom chest CT would be more likely to identify injuries.

The NGC summary ACR Appropriateness Criteria® blunt chest trauma—suspected aortic injury supports the use of chest CT angiography (CTA) in combination with chest radiography without reservation. The authors reported evidence that CTA is highly sensitive (with a high negative predictive value) in evaluating suspected traumatic aortic injury when there are no signs of direct aortic injury. CTA is also highly specific for aortic injury, such that most centers have now abandoned invasive aortography in the initial assessment of patients with suspected aortic injury from trauma.

CT is the imaging modality of choice in suspected thoracic spinal injury. In this setting, radiographs are of limited value and are considered "usually not appropriate."

In summary, chest CT is the gold standard routine imaging modality for detecting thoracic injuries caused by blunt trauma. Although wide use of chest CT has become standard, there is disagreement on whether routine chest CT is necessary in all patients with a history of blunt trauma. However, routine use of chest CT should be strongly considered in patients with high-mechanism, abnormal chest radiographs, altered mental status, distracting injuries, or clinically suspected thoracic injury. Ultimately, the frequency and timing of CT chest imaging should be site-specific and should depend on the local resources of the trauma center and patient status. CTA of the chest should be used routinely in patients with suspected acute aortic laceration, given the serious ramifications of missing such an injury.

Ultrasound

Ultrasound (US) in the setting of trauma has been most widely accepted in the form of the focused assessment with sonography for trauma (FAST), in which US is used to detect free fluid in the abdomen and pericardium. At some centers, FAST is also extended into the thorax to detect a pneumothorax and hemothorax, although the significance and use of extended FAST has yet to be defined. Multiple studies have shown

that US is superior to radiography but inferior to CT in detecting a pneumothorax. One small study of 27 patients showed that 11 had a pneumothorax detected by CT (gold standard), and all 11 pneumothoraces were detected by US. Only 4 of the 11 pneumothoraces were detected by supine radiography. In a recent meta-analysis, a group found there was very good sensitivity and specificity of US for a pneumothorax detected by CT (86%–98% and 97%–100%, respectively); however, supine radiography had limited sensitivity in detecting a pneumothorax (28%–75%), although its specificity was high (100%).

US can detect even a small hemothorax and is likely able to detect pleural fluid collections as small as 20 mL. When compared with radiography, US has been shown to be as accurate or more accurate in detecting a hemothorax. However, as in pneumothoraces, US may miss small hemothoraces.

There is limited literature on the use of US in the setting of other thoracic injuries, such as pulmonary injury and musculoskeletal trauma. In the setting of suspected cardiac injury and hypotension, echocardiography is often helpful in excluding cardiac chamber rupture and acute valvular injury; routine screening of patients with blunt trauma to the chest is not universally accepted. The role of US in the setting of blunt thoracic trauma will likely continue to evolve as we gain a better understanding of how to most rapidly, accurately, and safely image patients in this setting.

Magnetic Resonance Imaging

Magnetic resonance imaging (MRI) is not widely used in the trauma setting. As opposed to radiography, CT, and US, rapid image acquisition is not possible with MRI. Some studies may take up to 1 hour or more during which time patients cannot be monitored as closely as in the trauma bay. Furthermore, trauma patients are often not cooperative with breathing instructions and may require life support with devices that are not MRI-compatible. Some scattered publications (mainly case reports or small case series) describe the potential use of MRI in the setting of blunt thoracic trauma, specifically in the setting of cardiac or pericardial, musculoskeletal, or hemidiaphragmatic injuries. However, MRI is likely most useful as a problem-solving tool and not as part of a standard trauma protocol, except in rare instances of significant thoracic spinal injury as detailed in the NGC summary ACR Appropriateness Criteria® suspected spine trauma. The authors of this publication suggested that "a myelopathy indicates the need for imaging the symptomatic levels of the spine and spinal cord with MRI"; however, "screening the thoracolumbar spine with MRI for detecting ligamentous disruption is not indicated when the CT is normal."

Nuclear Medicine

Currently, nuclear medicine studies (including positron emission tomography using fluorine-18-2-fluoro-2-deoxy-D-glucose) do not have any well-established uses in the setting of blunt thoracic trauma. However, there may be some use in specific cases, such as in the setting of blunt cardiac injury.

Summary

- Chest radiography and chest CT/CTA are complementary first-line imaging modalities in the workup of patients with high-mechanism blunt trauma.
- When initial trauma survey and mechanism of injury suggest a low probability of significant thoracic trauma (normal mental status, normal clinical examination, and normal chest radiograph), further assessment with chest CT/CTA may not be necessary. Inclusion or exclusion of CT in this setting should be site and/or case-specific.
- In suspected cardiac injury (based on initial imaging and clinical evaluation), transthoracic echocardiography is indicated. Cardiac CTA, cardiac MRI, and transesophageal echocardiography may be useful as problem-solving tools.

Anticipated Exceptions

Nephrogenic systemic fibrosis (NSF) is a disorder with a scleroderma-like presentation and a spectrum of manifestations that can range from limited clinical sequelae to fatality. It appears to be related to both underlying severe renal dysfunction and the administration of gadolinium-based contrast agents. It has occurred primarily in patients on dialysis, rarely in patients with very limited glomerular filtration rate (GFR) (i.e., <30 mL/min/1.73 m^2), and almost never in other patients. There is growing literature regarding NSF. Although some controversy and lack of clarity remain, there is a consensus that it is advisable to avoid all gadolinium-based contrast agents in dialysis-dependent patients unless the possible benefits clearly outweigh the risk, and to limit the type and amount in patients with estimated GFR rates <30 mL/min/1.73 m^2. For more information, please see the American College of Radiology (ACR) Manual on Contrast Media (see the "Availability of Companion Documents" field).

Abbreviations

- CT, computed tomography
- CTA, computed tomography angiography

- MRI, magnetic resonance imaging
- SPECT, single photon emission computed tomography
- Tc, technetium
- TTE, transthoracic echocardiography
- US, ultrasound

Relative Radiation Level Designations

Relative Radiation Level*	Adult Effective Dose Estimate Range	Pediatric Effective Dose Estimate Range
O	0 mSv	0 mSv
☢	<0.1 mSv	<0.03 mSv
☢☢	0.1-1 mSv	0.03-0.3 mSv
☢☢☢	1-10 mSv	0.3-3 mSv
☢☢☢☢	10-30 mSv	3-10 mSv
☢☢☢☢☢	30-100 mSv	10-30 mSv
*RRL assignments for some of the examinations cannot be made, because the actual patient doses in these procedures vary as a function of a number of factors (e.g., region of the body exposed to ionizing radiation, the imaging guidance that is used). The RRLs for these examinations are designated as "Varies."		

Clinical Algorithm(s)

Algorithms were not developed from criteria guidelines.

Scope

Disease/Condition(s)

Blunt chest trauma

Guideline Category

Diagnosis

Evaluation

Clinical Specialty

Cardiology

Critical Care

Emergency Medicine

Internal Medicine

Nuclear Medicine

Radiology

Thoracic Surgery

Intended Users

Health Plans

Hospitals

Managed Care Organizations

Physicians

Utilization Management

Guideline Objective(s)

To evaluate the appropriateness of initial radiologic examinations for patients with blunt chest trauma

Target Population

Patients with blunt chest trauma

Interventions and Practices Considered

1. X-ray chest
2. Computed tomography (CT) chest
    - With contrast
    - Without contrast
    - Without and with contrast
3. Computed tomography angiography (CTA)
    - Chest with contrast
    - Coronary arteries with contrast
4. Ultrasound (US) chest
5. US echocardiography
    - Transthoracic resting
    - Transesophageal
6. Magnetic resonance imaging (MRI)
    - Chest without and with contrast
    - Chest without contrast
    - Heart function and morphology without and with contrast
    - Heart function and morphology without contrast
7. Thallium-201 single-photon emission computed tomography (SPECT) heart
8. Technetium (Tc)-99m sestamibi SPECT heart

Major Outcomes Considered

Utility of radiologic examinations in differential diagnosis and management

Methodology

Methods Used to Collect/Select the Evidence

Searches of Electronic Databases

Description of Methods Used to Collect/Select the Evidence

Literature Search Procedure

Staff will search in PubMed only for peer reviewed medical literature for routine searches. Any article or guideline may be used by the author in the narrative but those materials may have been identified outside of the routine literature search process.

The Medline literature search is based on keywords provided by the topic author. The two general classes of keywords are those related to the condition (e.g., ankle pain, fever) and those that describe the diagnostic or therapeutic intervention of interest (e.g., mammography, MRI).

The search terms and parameters are manipulated to produce the most relevant, current evidence to address the American College of Radiology Appropriateness Criteria (ACR AC) topic being reviewed or developed. Combining the clinical conditions and diagnostic modalities or therapeutic procedures narrows the search to be relevant to the topic. Exploding the term "diagnostic imaging" captures relevant results for diagnostic topics.

The following criteria/limits are used in the searches.

1. Articles that have abstracts available and are concerned with humans.
2. Restrict the search to the year prior to the last topic update or in some cases the author of the topic may specify which year range to use in the search. For new topics, the year range is restricted to the last 10 years unless the topic author provides other instructions.
3. May restrict the search to Adults only or Pediatrics only.
4. Articles consisting of only summaries or case reports are often excluded from final results.

The search strategy may be revised to improve the output as needed.

Number of Source Documents

The total number of source documents identified as the result of the literature search is not known.

Methods Used to Assess the Quality and Strength of the Evidence

Weighting According to a Rating Scheme (Scheme Given)

Rating Scheme for the Strength of the Evidence

Strength of Evidence Key

Category 1 - The conclusions of the study are valid and strongly supported by study design, analysis and results.

Category 2 - The conclusions of the study are likely valid, but study design does not permit certainty.

Category 3 - The conclusions of the study may be valid but the evidence supporting the conclusions is inconclusive or equivocal.

Category 4 - The conclusions of the study may not be valid because the evidence may not be reliable given the study design or analysis.

Methods Used to Analyze the Evidence

Review of Published Meta-Analyses

Systematic Review with Evidence Tables

Description of the Methods Used to Analyze the Evidence

The topic author drafts or revises the narrative text summarizing the evidence found in the literature. American College of Radiology (ACR) staff draft an evidence table based on the analysis of the selected literature. These tables rate the strength of the evidence (study quality) for each article included in the narrative text.

The expert panel reviews the narrative text, evidence table, and the supporting literature for each of the topic-variant combinations and assigns an appropriateness rating for each procedure listed in the table. Each individual panel member assigns a rating based on his/her interpretation of the available evidence.

More information about the evidence table development process can be found in the ACR Appropriateness Criteria® Evidence Table Development document (see the "Availability of Companion Documents" field).

Methods Used to Formulate the Recommendations

Expert Consensus (Delphi)

Description of Methods Used to Formulate the Recommendations

Rating Appropriateness

The appropriateness ratings for each of the procedures included in the Appropriateness Criteria topics are determined using a modified Delphi methodology. A series of surveys are conducted to elicit each panelist's expert interpretation of the evidence, based on the available data, regarding the appropriateness of an imaging or therapeutic procedure for a specific clinical scenario. American College of Radiology (ACR) staff distribute surveys to the panelists along with the evidence table and narrative. Each panelist interprets the available evidence and rates each procedure. The surveys are completed by panelists without consulting other panelists. The appropriateness rating scale is an ordinal scale that uses integers from 1 to 9 grouped into three categories: 1, 2, or 3 are in the category "usually not appropriate"; 4, 5, or 6 are in the category "may be appropriate"; and 7, 8, or 9 are in the category "usually appropriate." Each panel member assigns one rating for each procedure for a clinical scenario. The ratings assigned by each panel member are presented in a table displaying the frequency distribution of the ratings without identifying which members provided any particular rating.

If consensus is reached, the median rating is assigned as the panel's final recommendation/rating. Consensus is defined as eighty percent (80%) agreement within a rating category. A maximum of three rounds may be conducted to reach consensus. Consensus among the panel members must be achieved to determine the final rating for each procedure.

If consensus is not reached, the panel is convened by conference call. The strengths and weaknesses of each imaging procedure that has not reached consensus are discussed and a final rating is proposed. If the panelists on the call agree, the rating is proposed as the panel's consensus. The document is circulated to all the panelists to make the final determination. If consensus cannot be reached on the call or when the document is circulated, "No consensus" appears in the rating column and the reasons for this decision are added to the comment sections.

This modified Delphi method enables each panelist to express individual interpretations of the evidence and his or her expert opinion without excessive influence from fellow panelists in a simple, standardized and economical process. A more detailed explanation of the complete process can be found in additional methodology documents found on the ACR Web site (see also the "Availability of Companion Documents" field).

Rating Scheme for the Strength of the Recommendations

Not applicable

Cost Analysis

A formal cost analysis was not performed and published cost analyses were not reviewed.

Method of Guideline Validation

Internal Peer Review

Description of Method of Guideline Validation

Criteria developed by the Expert Panels are reviewed by the American College of Radiology (ACR) Committee on Appropriateness Criteria.

Evidence Supporting the Recommendations

Type of Evidence Supporting the Recommendations

The recommendations are based on analysis of the current literature and expert panel consensus.

Benefits/Harms of Implementing the Guideline Recommendations

Potential Benefits

Selection of appropriate radiologic imaging procedures for blunt chest trauma

Potential Harms

Gadolinium-based Contrast Agents

Nephrogenic systemic fibrosis (NSF) is a disorder with a scleroderma-like presentation and a spectrum of manifestations that can range from limited clinical sequelae to fatality. It appears to be related to both underlying severe renal dysfunction and the administration of gadolinium-based contrast agents. It has occurred primarily in patients on dialysis, rarely in patients with very limited glomerular filtration rate (GFR) (i.e., <30 mL/min/1.73 m^2), and almost never in other patients. Although some controversy and lack of clarity remain, there is a consensus that it is advisable to avoid all gadolinium-based contrast agents in dialysis-dependent patients unless the possible benefits clearly outweigh the risk, and to limit the type and amount in patients with estimated GFR rates <30 mL/min/1.73 m^2. For more information, please see the American College of Radiology (ACR) Manual on Contrast Media (see the "Availability of Companion Documents" field).

Relative Radiation Level (RRL)

Potential adverse health effects associated with radiation exposure are an important factor to consider when selecting the appropriate imaging procedure. Because there is a wide range of radiation exposures associated with different diagnostic procedures, a relative radiation level indication has been included for each imaging examination. The RRLs are based on effective dose, which is a radiation dose quantity that is used to estimate population total radiation risk associated with an imaging procedure. Patients in the pediatric age group are at inherently higher risk from exposure, both because of organ sensitivity and longer life expectancy (relevant to the long latency that appears to accompany radiation exposure). For these reasons, the RRL dose estimate ranges for pediatric examinations are lower as compared to those specified for adults. Additional information regarding radiation dose assessment for imaging examinations can be found in the ACR Appropriateness Criteria® Radiation Dose Assessment Introduction document (see the "Availability of Companion Documents" field).

Qualifying Statements

Qualifying Statements

The American College of Radiology (ACR) Committee on Appropriateness Criteria and its expert panels have developed criteria for determining appropriate imaging examinations for diagnosis and treatment of specified medical condition(s). These criteria are intended to guide radiologists, radiation oncologists, and referring physicians in making decisions regarding radiologic imaging and treatment. Generally, the complexity and severity of a patient's clinical condition should dictate the selection of appropriate imaging procedures or treatments. Only those examinations generally used for evaluation of the patient's condition are ranked. Other imaging studies necessary to evaluate other co-existent diseases or other medical consequences of this condition are not considered in this document. The availability of equipment or personnel may influence the selection of appropriate imaging procedures or treatments. Imaging techniques classified as investigational by the U.S. Food and Drug Administration (FDA) have not been considered in developing these criteria; however, study of new equipment and applications should be encouraged. The ultimate

decision regarding the appropriateness of any specific radiologic examination or treatment must be made by the referring physician and radiologist in light of all the circumstances presented in an individual examination.

Implementation of the Guideline

Description of Implementation Strategy

An implementation strategy was not provided.

Institute of Medicine (IOM) National Healthcare Quality Report Categories

IOM Care Need

Getting Better

IOM Domain

Effectiveness

Timeliness

Identifying Information and Availability

Bibliographic Source(s)

Chung JH, Cox CW, Mohammed TH, Kirsch J, Brown K, Dyer DS, Ginsburg ME, Heitkamp DE, Kanne JP, Kazerooni EA, Ketai LH, Ravenel JG, Saleh AG, Shah RD, Steiner RM, Suh RD, Expert Panel on Thoracic Imaging. ACR Appropriateness CriteriaÂ® blunt chest trauma. [online publication]. Reston (VA): American College of Radiology (ACR); 2013. 9 p. [53 references]

Adaptation

Not applicable: The guideline was not adapted from another source.

Date Released

2013

Guideline Developer(s)

American College of Radiology - Medical Specialty Society

Source(s) of Funding

The American College of Radiology (ACR) provided the funding and the resources for these ACR Appropriateness Criteria®.

Guideline Committee

Committee on Appropriateness Criteria, Expert Panel on Thoracic Imaging

Composition of Group That Authored the Guideline

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Financial Disclosures/Conflicts of Interest

Not stated

Guideline Status

This is the current release of the guideline.

Guideline Availability

Electronic copies: Available from the American College of Radiology (ACR) Web site .

Print copies: Available from the American College of Radiology, 1891 Preston White Drive, Reston, VA 20191. Telephone: (703) 648-8900.

Availability of Companion Documents

The following are available:

- ACR Appropriateness Criteria®. Overview. Reston (VA): American College of Radiology; 2013 Nov. 3 p. Electronic copies: Available in Portable Document Format (PDF) from the American College of Radiology (ACR) Web site .
- ACR Appropriateness Criteria®. Literature search process. Reston (VA): American College of Radiology; 2013 Apr. 1 p. Electronic copies: Available in PDF from the ACR Web site .
- ACR Appropriateness Criteria®. Evidence table development – diagnostic studies. Reston (VA): American College of Radiology; 2013 Nov. 3 p. Electronic copies: Available in PDF from the ACR Web site .
- ACR Appropriateness Criteria®. Radiation dose assessment introduction. Reston (VA): American College of Radiology; 2013 Nov. 3 p. Electronic copies: Available in PDF from the ACR Web site .
- ACR Appropriateness Criteria®. Manual on contrast media. Reston (VA): American College of Radiology; 90 p. Electronic copies: Available in PDF from the ACR Web site .
- ACR Appropriateness Criteria®. Procedure information. Reston (VA): American College of Radiology; 2013 Apr. 1 p. Electronic copies: Available in PDF from the ACR Web site .
- ACR Appropriateness Criteria® blunt chest trauma. Evidence table. Reston (VA): American College of Radiology; 2013. 17 p. Electronic copies: Available in PDF from the ACR Web site .

Patient Resources

None available

NGC Status

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